Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00062, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-00062
EGU General Assembly 2008

Source Rupture Characteristics of the Sumatra-Andaman, Nias-Simeulue and Southern Sumatra Megathrust Earthquakes of 2004-2007 and Their Tsunamis *

T. Taymaz (1), S. Yolsal (1) and A.C. Yalciner (2)

(1) Istanbul Technical University, Department of Geophysical Engineering, Seismology Section, Maslak 34469, Istanbul, Turkey, (2) Middle East Technical University, Department of Civil Engineering, Ankara 06531, Turkey (taymaz@itu.edu.tr; yolsalse@itu.edu.tr; yalciner@metu.edu.tr / Fax: +90-212-2856201 / Phone: +90-212-2856245)

This study emphasizes the importance of combining existing datasets in determining source rupture characteristics of great earthquakes, and associated tsunami phenomenon, if any. We have obtained source rupture parameters, spatio-temporal slip distributions of the recent megathrust earthquakes of 2004-2007, and of those major aftershocks by waveform modeling of teleseismic P- and SH- body-waves, and associated tsunami wave propagations occurred along the Sumatra-Andaman, Nias-Simeulue, and southern Sumatra to improve our understanding of the tectonic processes and lithospheric deformation along the Indo-Australian-Sunda region. These megathrust earthquakes have produced the most extensive high-quality broad-band and long-period seismic data ever recorded, and freely available through FDSN and IRIS consortiums. The great Sumatra-Andaman megathrust earthquake of December 26, 2004 (M_w $\sim$9.3) ruptured about 1600 km long portion of the fault boundary between the southeastern Eurasian and Indo-Australian plates and generated a devastating tsunami causing more than 280,000 deaths with thousands more reported missing. The slip distributions studies indicate that fault slip of up to $\sim$20 meters occurred near the Banda-Aceh. Tsunami observations and simulation studies confirm that the additional slow slip of the plate interface may have occurred in the north over an

hour or so. Furhermore, March 28, 2005 Nias-Simeulue earthquake (M_w ∼8.6) was caused by the rupture of a portion of the Sunda megathrust offshore northern Sumatra with no significant tsunami waves generated. This earthquake nucleated between two separate slip patches beneath Nias and Simeulue Islands. The two largest megathrust earthquakes of the southern Sumatra occurred on September 12, 2007 (M_w ∼8.5 and M_w ∼8.1), its major aftershocks, and related tsunami waves were also studied in detail. For simulation of tsunami generation and wave propagation, we have further applied the numerical models of TUNAMI-N2, AVI-NAMI and NAMI-DANCE based on nonlinear shallow water theory with GEBCO-BODC bathymetry data for the study region. The parameters of faulting geometry (source depth, strike, dip, rake angles), amount of slip at the centroid-depth, the faulting area, radiated seismic moment, location (distance from shore and centroid depth) and the beach geometry are used in generating numerical models for tsunami simulations. The details of tsunami development and wave propagation will be presented in the light of the regional tectonics and seismological parameters obtained.

---

* The early inversions of P and SH body-waves and the slip distribution models of December 26, 2004 the megathrust Sumatra-Andaman earthquake is presented at the Web site http://www.geop.itu.edu.tr/∼taymaz/sumatra.